PATENT
Serial No. 09/734,228
Attorney Docket No. 450117-02965

REMARKS

Favorable reconsideration of the application is respectfully requested in light of the amendments and remarks herein.

Upon entry of this amendment, claims 1–2, 4–7, 9–12, and 14–21 will be pending. By this amendment, claims 1 and 14 have been amended. No new matter has been added.

§ 103 Rejection of Claims 1–2, 4–5, 9, 14 and 18–21

In Section 4 of the Office Action, claims 1–2, 4–5, 9, 14 and 18–21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Jiang *et al.* (U.S. Patent No 6,539,353; hereinafter referred to as "Jiang") in view of Ehsani *et al.* (U.S. Publication No. 2002/0128821; hereinafter referred to as "Ehsani"), and further in view of Kimura et al. (USPN 6,067,510; hereinafter referred to as "Kimura"). Claims 1 and 14 have been amended to clarify and to round out the scope of protection to which Applicant is entitled.

In the Background section of the Specification, it is stated that "[o]ne major drawback of conventional methods and devices for large vocabulary speech recognition is the large complexity and the large number of possible candidates of speech fragments or elements to be searched for and to be tested. Without limiting the scope of subject-matter and therefore the scope of vocabulary, all possible candidates for speech elements or speech fragments have to be evaluated by distinct searching techniques." *Background of the Specification, page 3, lines 1–6.*

To address the above-described drawback of the conventional large vocabulary speech recognition, embodiments of the present invention provide methods and apparatus for

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recognizing speech in a more efficient manner. For example, the steps of method claim 1, as

presented herein, include:

"(a) *receiving* a speech phrase;

(b) *generating* a signal being representative to said speech phrase;

(c) *pre-processing and storing* said signal with respect to a determined set of rules;

(d) *generating* from said pre-processed signal at least one series of hypothesis speech elements;

(e) *determining* at least one series of words being most probable to correspond to said speech phrase by applying a predefined language model to said at least one series of hypothesis speech elements,

wherein determining said at least one series of words further comprises:

(1) *determining* at least one sub-word, word, or a combination of words most probably being contained as a seed sub-phrase in said received speech phrase,

wherein said seed sub-phrase is recognized with an appropriate high degree of reliability, such that segments of speech which are recognized with high reliability are used to constrain the search in other areas of the speech signal where the language model employed cannot adequately restrict the search; and

(2) *continuing determining* words or combinations of words, which are consistent with said seed sub-phrase as at least a first successive sub-phrase which is contained in said received speech phrase, by inserting additional, paired and/or higher order information, including semantic and/or pragmatic information, between the sub-phrases, thereby decreasing the burden of searching,

wherein said semantic information includes description of said sub-phrases and said pragmatic information includes connecting information connecting said sub-phrases to actual situation, application, and/or action, and

wherein the predefined language model contains a low-perplexity recognition grammar obtained from a conventional recognition grammar by:

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       (3) *identifying and extracting* word classes of high-perplexity from the conventional grammar;

       (4) *generating* a phonetic, phonemic and/or syllabic description of the high-perplexity word classes, in particular by applying a sub-word-unit grammar compiler to them, to produce a sub-word-unit grammar for each high-perplexity word class; and

       (5) *merging* the sub-word-unit grammars with the remaining low-perplexity part of the conventional grammar to yield said low-perplexity recognition grammar; and

      wherein said at least one series or words substantially comprises at least one low-perplexity part which can be analyzed and recognized with a high degree of reliability, and remaining parts which are treated as high-perplexity parts, and

      wherein <u>pragmatic information</u> contained in said at least one low-perplexity part with respect to at least one of said high-perplexity part; <u>may be used to explain said at least one of said high-perplexity parts.</u>"

(emphasis added)

Accordingly, in one aspect of claim 1, the speech recognition method includes <u>pragmatic information</u> including connecting information connecting sub-phrases to actual situation, application, and/or action, and where the at least one series or words substantially comprises at least one low-perplexity part which can be analyzed and recognized with a high degree of reliability, and remaining parts which are treated as high-perplexity parts, and the <u>pragmatic information</u> contained in the at least one low-perplexity part with respect to at least one of the high-perplexity parts <u>may be used to explain the at least one of the high-perplexity parts</u>. *See Specification, page 5, line 34–37, and page 11, lines 9–11. (emphasis added).*

The Office Action states that Jiang "lacks identifying and extracting word classes of high-perplexity, applying a compiler, merging the sub-word-unit grammars with the remaining low-perplexity part and inserting additional information." *Office Action, page 4, lines 10–12.* Further, Jiang fails to teach or suggest that <u>pragmatic information</u> contained in the at least one

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low-perplexity part with respect to at least one of the high-perplexity parts <u>may be used to</u>

<u>explain the at least one of the high-perplexity parts</u>. Because Jiang fails to teach or suggest all

the limitations of claim 1, claim 1 should therefore be allowable over Jiang.

As to Ehsani, the Office Action further states, "Ehsani discloses phrase-based dialogue

modeling method for producing a low-perplexity recognition grammar from a conventional

grammar having <u>semantic information</u> including a description <u>between</u> sub-phrases ...

comprising: (a) identifying and extracting word classes ...; (b) generating a phonetic, phonemic

and/or syllabic description ...; (c) merging sub-word-unit grammars ...; and wherein said seed

sub-phrase is recognized with an appropriate high degree of reliability, such that segments of

speech that are recognized with high reliability are used to constrain the search in other areas of

the speech signal where the language model employed cannot adequately restrict the search

(column 3, paragraph 0059, column 5, paragraph 100 and column 11, paragraph 0221.)" *Office*

Action, page 4, line 13 to page 5, line 12. (emphasis added)

However, embodiments of the present invention provide for the use of not only <u>semantic</u>

<u>information</u>, but also for <u>pragmatic information</u> contained in a reliably recognizable part of the

speech phrase that is useful to explain another part of higher perplexity. That is, "[t]he

searching for proper candidates as recognized sub-phrases therefore splits up the whole phrase

into at least one low-perplexity or low-complexity part, which can be analyzed and recognized

with high degree of reliability. The other parts or sub-phrases of the received speech phrase are

treated as high-perplexity or high-complexity parts." *Specification, page 5, lines 23–37.* "In the

case of FIG. 3A the explanation for the high-perplexity part HP is contained in a part of the low-

perplexity part LP, i.e. in the spelling sequence built up by the low-perplexity parts LP21 to

LP2n. This is an example where the <u>low-perplexity part itself contains pragmatic information</u>

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with respect to the high-perplexity part HP to be explained by the low-perplexity part LP.

Specification, page 11, lines 7–11. (emphasis added)

By contrast, Ehsani fails to teach or suggest that pragmatic information contained in the at least one low-perplexity part with respect to at least one of the high-perplexity parts may be used to explain the at least one of the high-perplexity parts, and thus fails to teach or suggest all of the limitations of claim 1. Because Jiang and Ehsani, either individually or in combination, fail to teach all of the limitations of claim 1, claim 1 should therefore be allowable over Jiang and Ehsani.

Kimura was cited for teaching only of inserting additional, higher order information (hierarchy), including semantic (semantic features), between the sub-phrases, thereby decreasing the burden of searching, wherein the semantic information includes description of the sub-phrases. Therefore, Jiang, Ehsani, and Kimura, individually or in combination, fail to teach or suggest that pragmatic information contained in the at least one low-perplexity part with respect to at least one of the high-perplexity parts may be used to explain the at least one of the high-perplexity parts.

Based on the foregoing discussion, it is maintained that claim 1 should be allowable over Jiang, Ehsani, and Kimura. Since claim 14 parallels and recites substantially similar limitations as recited in claim 1, claim 14 should also be allowable over Jiang, Ehsani, and Kimura. Further, since claims 2, 4–5, 9 and 18–21 depend from one of claims 1 and 14, claims 2, 4–5, 9 and 18–21 should also be allowable over Jiang, Ehsani, and Kimura.

Accordingly, it is submitted that the rejection of claims 1–2, 4–5, 9, 14 and 18–21 based upon 35 U.S.C. §103(a) has been overcome by the present remarks and withdrawal thereof is respectfully requested.

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§ 103 Rejection of Claims 6–7 and 10–12

In Section 5 of the Office Action, claims 6–7 and 10–12 stand rejected under 35 U.S.C.

§103(a) as being unpatentable over Jiang in view of Ehsani and Kimura, as applied to claims 1

and 14, and in further view of Chou et al. (U.S. Patent No. 5,797,123; hereinafter referred to as

"Chou").

Based on the foregoing discussion regarding claim 1, and since claims 6–7 and 10–12

depend from claim 1, claims 6–7 and 10–12 should be allowable over Jiang, Ehsani and Kimura.

Chou was merely cited for teaching "limited vocabulary word spotting (low perplexity) with a

parallel network of subword models used to model the non-keyword portions of the input

utterance (high-perplexity)"; for teaching "the insertion of functional words and filler phrases

into the detection network to improve recognition of key-phrases"; and for teaching "the merging

of the states of the key-phrase network." Therefore, Jiang, Ehsani, and Chou, individually or in

combination, fail to teach or suggest that pragmatic information contained in the at least one low-

perplexity part with respect to at least one of the high-perplexity parts may be used to explain the

at least one of the high-perplexity parts.

Accordingly, it is submitted that the rejection of claims 6–7 and 10–12 based upon 35

U.S.C. §103(a) has been overcome by the present remarks and withdrawal thereof is respectfully

requested.

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Conclusion

In view of the foregoing, entry of this amendment, and the allowance of this application

with claims 1–2, 4–7, 9–12, and 14–21 are respectfully solicited.

In regard to the claims amended herein and throughout the prosecution of this

application, it is submitted that these claims, as originally presented, are patentably distinct over

the prior art of record, and that these claims were in full compliance with the requirements of 35

U.S.C. §112. Changes that have been made to these claims were not made for the purpose of

patentability within the meaning of 35 U.S.C. §§101, 102, 103 or 112. Rather, these changes

were made simply for clarification and to round out the scope of protection to which Applicant is

entitled.

In the event that additional cooperation in this case may be helpful to complete its

prosecution, the Examiner is cordially invited to contact Applicant's representative at the

telephone number written below.

The Commissioner is hereby authorized to charge any insufficient fees or credit any

overpayment associated with the above-identified application to Deposit Account 50-0320.

Respectfully submitted,

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